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THE NAIADES OF MISSOURI.—VI.

BY WILLIAM I. UTTERBACK.

Lasmonos simpsoni (Ferriss).

(Simpson's Shell.)
Pl. XXVI, Figs. 91 A and B.

1900—*Lampsilis simpsoni* Ferriss, Nautilus, xiv, p. 38.

ANIMAL CHARACTERS unknown to writer.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subovate, elongated, subsolid, narrowly rounded in front, broadly rounded behind, somewhat alated; disk smooth; beaks low, sculptured by ridges somewhat corrugated and nodulous; epidermis tawny with green rays with rather roughened growth lines; hinge line evenly curved.

INTERNAL STRUCTURES:—Cardinals reduced to mere stumpy rudiments; laterals single in right, very faintly double in left valve; anterior scars rather deep, posterior shallow; nacre bluish shaded with violet, copper or pink.

Sex	Length		Height		Diameter	Locality
♂	78	x	46	x	28mm.	(White R., Hollister)
♀	95	x	50	x	22 "	(" " ")

MISCELLANEOUS REMARKS:—No juveniles, nor young shells, have been obtained by the writer in this State. However, Mr. Ferriss, the author, has obtained a good suite from Spring River, Hardy, Arkansas, and has described the young shells as possessing an epidermis with green rays and "coppery beaks," a well marked post-umbonal ridge and low but distinct beaks with coarse corrugations. The author of this species, groups it between *Lasmonos fragilis* and *leptodon.* From the former it may be distinguished by a thicker more elongated shell, by more reduced hinge teeth and less varigated nacre and from the latter by being more inflated, wider, thicker, not so pointed posteriorly and with fewer rays. Hence its place can be fairly well determined conchcologically. Future studies of its marsupial and glochidial characters of this species, as well as that of *leptodon* (=*S. teniussimus* Lea), may classify it far differently, since shell characters are too liable for parallelism and convergence as true bases of classification.

Lasmonos leptodon? (Rafinesque).

Not Figured.

1820—*Unio* (*Leptodea*) *leptodon* Rafinesque, Ann. Gen. Sci. Phys. Brux., p. 295, Pl. LXXX.

1829—*Symphynota tenuissima* Lea, Tr. Am. Phil. Soc., III, p. 435, Pl. XI, Fig. 21.

This species is listed here on the strength of reports of its occurrence in the Mississippi and Neosho Rivers of this State. From a shell, (measuring 58x31x14mm.), received from Michigan through exchange, the author is able to make comparisons and thus concur with the general assumption that it should group under *Lasmonos*. However, superficial observations would group it near *Lastena ohiensis*, but presence of hinge teeth, although not well developed, and also different beak sculpture would sufficiently separate it. Surely the "clear water streams" of South Missouri may also yield specimens of this species since the same rivers that reach up into Missouri are reported to bear it in Arkansas. Scammon (1906, pp. 304 and 305) reports it for Kansas and Simpson describes its general range for the upper Mississippi drainage south to the Tennessee River and for Southern Michigan.[1]

Genus **Proptera** Rafinesque.

1819—*Proptera* Rafinesque, Monog. An. Gen. Sci. Phys. Brux.;—1900b, Simpson, Pr. U. S. Nat. Mus., XXII, p. 566, (as sub genus); 1912b, Ortmann, An. Car. Mus., VIII, p. 332.

(Type, *Unio alatus* Say)

ANIMAL CHARACTERS:—Branchial opening with dense papillae; anal crenulated; supra-anal small, moderately closely connected to anal; inner laminae entirely connected to visceral mass; palpi only slightly antero-dorsad; marsupia reniform occupying posterior part of outer gills, consisting of several ovisacs; conglutinates not solid, broken; glochidium ax-head or celt-shape, usually armed with two spines at each corner of ventral edge of each valve; mantle border antero-ventrad to branchial opening slightly lamellar with crenulations only.

SHELL CHARACTERS:—Shell subelliptic or subovate, solid to thin, strongly alated post-dorsad; disk smooth; hinge fairly well developed; beaks low, sculptured by the early bars of fine concentric arrangement and later one of double-looped type—sometimes rather nodulous at base of post ridge; sexually dimorphic, the female shell being wider posteriorly by the expansion of the post-ventrad edge of shell.

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[1] The presence of *L. leptodon* in Missouri need not be so questionable now because of A. A. Hinkley's recent report of it in the James River at Galena this State. (Dec. 23, 1915, Pr. U. S. Nat. Mus., Vol. 49, p. 588.)

MISCELLANEOUS REMARKS:—With the exception of unique glochidium and more developed hinge this genus stands with *Lasmonos*. *Proptera* is represented in this state by the four species: *alata*, which is found mostly in Central Mo., *purpurata* which only occurs in South Mo., *laevissima* which is mostly restricted to North Mo., and *capax* which is entirely confined to the Mississippi River. The last named species has not been definitely settled within any genus before on account of a lack of an exact determination concerning the morphology of its animal. The extreme inflation of the *capax* shell, as compared to the compressed-type of the other members of this genus, would seem to shut it out, but glochidial and marsupial characters (besides its similar beak sculpture) are by far more reliable affinities. All the members of this most sharply defined genus are long period breeders.

Proptera alata (Say).

("Razor Back," "Rudder Back," "Hatchet Back,"
"Pan Cake.")

Pl. IV, Fig. 11a.

1816—*Unio alatus* Say, Nich, Encyc., II, pl. IV, fig. 2.
1898—*Lampsilis alatus* Baker, Moll. Chicago, Pt. I, p. 97, pl. XVIII.
1912b—*Proptera alata* (Say) Ortmann, An. Car. Mus., VIII, p. 333.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial and anal openings inclined to tubular structure, branchial upcurved, small with numerous papillae; anal smooth thick edges; supra-anal large thick and close mantle connection to anal; inner laminae of inner gills entirely connected to visceral mass; palpi about as wide as long, connected about one-half of their length antero-dorsad; color of soft part tan-flesh color with dark mantle edges and orange colored cerebral ganglion.

REPRODUCTIVE STRUCTURES:—Marsupia large, occupying posterior half of outer gills, consisting of large ovisacs sulcated ventrad mantle edge antero-ventrad to branchial opening lamelar with

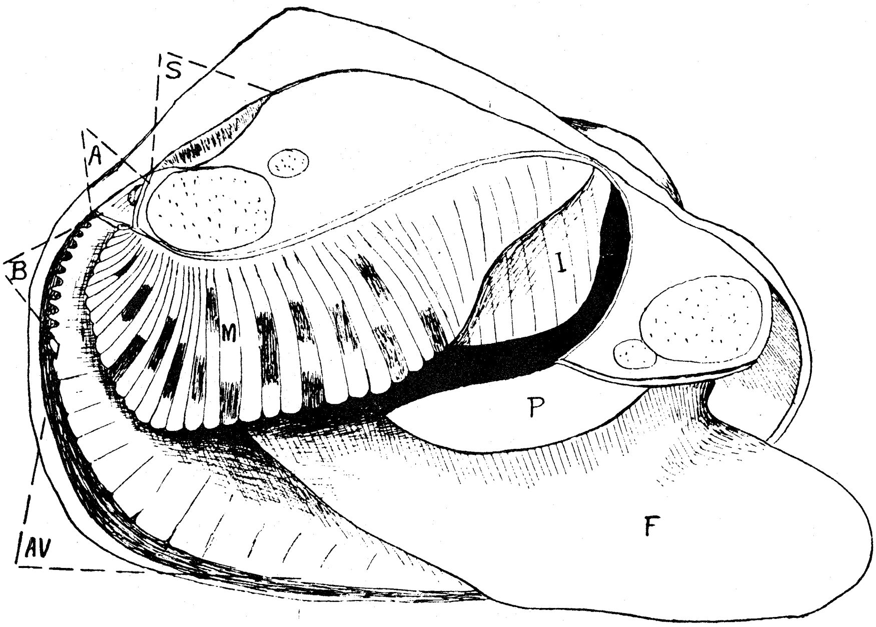

FIG. 8. *Proptera alata* (Say) ♀. Diagram of a gravid individual from Platte River, Agency Ford, showing animal characters in left valve. Coll. June 7, 1913. (¾ Nat. size.)

crenulations; conglutinates large, broken with ova or glochidia all through the mass; glochidia large, ax-head shape, with spine at each ventral corner of shell (0.220 x 0.380 mm.).

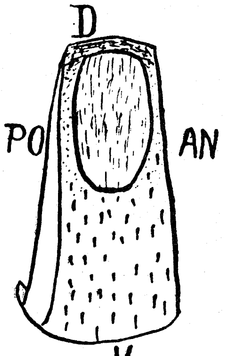

FIG. 9a. Lateral view of mature glochidium of *P. alata*. (x87.)

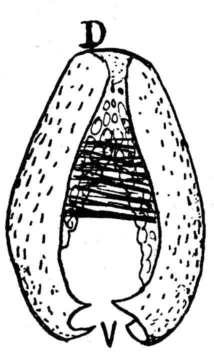

FIG. 9b. Anterior view of open glochidium of *P. alata*. (x87.)

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell large broadly elliptical, solid alated post-dorsad; somewhat inflated at middle of disk, beaks low sculptured concentrically and also double-looped; disk not sculptured; epidermis usually black-reddish with broad rays in young specimens; female shells blunt, or even truncate, vertically for its posterior end.

INTERNAL STRUCTURES:—Cardinals erect-double in both valves; laterals also double placed at an upward angle; beak cavities moderately deep; nacre usually purple.

Sex	Length		Height		Diameter	Locality
♀	156	x	117	x	56.5	(Platte, R., Dixon Falls)
♂	150	x	114	x	53.0	(" ' Platte City)
♀	115	x	55	x	33.0	(Osage R., Warsaw)
♀	82	x	54	x	26.0	(Grand R., Utica)

MISCELLANEOUS REMARKS:—This species is most typical in North Missouri; the shell is thinner, smaller and rather dwarfed in Central Missouri and is wholly lacking in South Missouri drainage. The writer has only found *alata* lacustrine on one occasion, but that may have been due to accidental translocation. Breeding records show it to be bradytictic. The writer has observed that most marsupia of this species, when gravid with ripe glochidia, have purplish blotched marsupia; this character, however, is rather inconstant. *Alata* has a general distribution throughout the Mississippi and St. Lawrence River basins.

Proptera purpurata (Lamarck).

("Purple Shell," "Purply," "Buttermilk Shell," Red Shell.")

Pl. XXVI, Figs. 92 A—D.

1819—*Unio purpurata* Lamack, An. Sans. Vert., VI, p. 71.

1900b—*Lampsilis purpuratus* Smpson, Pr. U. S. Nat. Mus., XXII, p. 568.

1912b—*Proptera purpurata* (Lam.) Ortmann, An. Car. Mus., VIII, p. 234.

ANIMAL CHARACTERS.

NUTRITIVE CHARACTERS:—Identical with those of *alata*.

REPRODUCTIVE STRUCTURES:—Marsupium consists of twenty ovisacs placed in posterior half of outer gills; glochidia (according to Lea) ax-head shape—no measurement given.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell large, rather elongate—elliptical, inflated; disk smooth; beaks high and full; post dorsal ridge somewhat alated; post umbonal ridge biangulated; epidermis glossy black.

INTERNAL STRUCTURES:—Cardinals double in both valve; laterals prominent, blade-like; umbonal and branchial cavities deep and rounded out; nacre rich purple.

Sex	Length		Height		Diameter	Locality
♂	120	x	75	x	53mm	(White R., Hollister)
♀	125	x	70	x	44mm	(" " Forsyth)
♂	83	x	56	x	40mm	(" " Hollister)
♀	70	x	47	x	34mm	(" " ")

MISCELLANEOUS REMARKS:—The young shells of *P. purpurata* are thin and fragile but later become thick and solid; resembling *alata* in form and nacre but is more so alated not compressed. This shell only appears in the White and Neosho River basins and is one of the few not found in the Mississippi. Its favorite habitat is deep water and mud bottoms. It is hoped its glochidium may be verified and more proportionate measurements given than Lea was able to record.

Proptera laevissima (Lea).

("Paper Shell," "Double Wing.")

Pl. IX, Figs. 19 and 20; Pl. XXVI, Figs. 94 A—D.

1830—*Symphynota laevissima* Lea, Tr. Am Phil Soc., III, p. 444, pl. XIII, fig. 23.

1900b—*Lampsilis laevissima* Simpson, Pr. U. S. Nat. Mus., XXII, p. 574.

1912b—*Proptera laevissima* (Lea) Ortmann, An. Car. Mus., VIII, p. 334.

ANIMAL CHARACTERS

NUTRITIVE STRUCTURES:—Branchial and anal openings very tubular, directed away from each other; anal smooth; supra-anal high, well separated from anal by mantle connection; inner laminae of inner gills entirely connected to visceral mass; palpi broader than long, connected about one-half of the length antero-dorsad; color of soft parts a modest tan, except for mantle edges at siphonal openings and the area over nephridium.

REPRODUCTIVE STRUCTURES:—Marsupium large, kidney-shaped occupying over half of posterior part of outer gills and consisting 50–60 narrow ovisacs somewhat distended transversely and very much so ventrad from original edge of sterile marsupium, ventral tips of ovisacs teat-like, not colored; conglutinates white, discharged in broken disintegrated masses; glochidium ax-head shape or celtiform,' small with spine-like structures measuring 0.100 x 0.155mm; branchial mantle edge thickened, lamellar, but without palpilae.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell elliptical compressed, thin, bialated, post-ala being drawn near to the beaks in definite lobes of growth, sometimes curved laterally; disk without any sculpture; post-umbonal ridge absent, female shell swollen post-ventrad; epidermis brown-glistening horn-color with faint rays and areas of indigo blue especially on post wing; beaks low, suppressed sculptured with a few fine concentric lines and a row of three small tubercles on line with a post-ridge.

INTERNAL STRUCTURES:—Cardinals thin, erect, double in right, single in left valve, laterals rather reduced; scars somewhat faintly impressed; beak and branchial cavities rather shallow; nacre solid purple.

Sex	Length		Height		Diameter	Locality
♂	150	x	105	x	42mm	(102 R., St. Joseph)
♂	145	x	90	x	39mm	(Mud Lake, Kenmoor)
♀	137	x	89	x	37mm	(Platte, R., Agency Ford)
♀	41	x	23	x	12mm	(Lake Contrary, St. Joseph)

The last measurement of a juvenile—*the youngest and smallest Naiad shell ever found gravid by the writer.* Its glochidia were normal. Many of these juveniles are in the writer's cabinet, having been collected in "nests" from L. Contrary for the most part. The shells are like those of ground glass in color and transluscent both externally and internally. Beaks are rather apiculated and marked by rather coarse concentric ridges with three teat-like tubercles arranged in a row on line with post-ridge, resembling juvenile beak sculpture of *Lasmonos.*

MISCELLANEOUS REMARKS:—This species may represent the critical transition period from the primitive to the actual modern forms. Its glochidium is not a true *Proptera form in not* possessing typical spines at the ventral corners of its valves. Coker and Surber (1911, pp. 179–182) have pointed out its metamorphosis in the parasitic life as eccentric in that the glochidium remains intact as a saddle over the beginning of its adult shell. No species, perhaps, has such tubular development of mantle edges for the branchial and anal openings. In this state its distribution is peculiar, being almost exclusively found in North Missouri and never in South Missouri. It is often found in company with *alata* from which it can be separated on account of thick shell and coarser epidermis of the latter. It may be mentioned here that *laevissima shows the highest modern development of the siphonal openings, i. e., into the actual tubular form.* (See Plate IX). This Species is distinctly bradytictic.

Proptera capax (Green).

("Pocket Book," "Swell Shell.")

Pl. XXVI, Figs. 93 A and B.

1832—*Unio capax* Green, Cab. Nat. Hist., II, p. 290.
1899—*Lampsilis capax* Smith, Bull U. S. Fish Com., p. 291, pl. LXXIV.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening with rusty red papillae arranged in two ranks; anal finely crenulated; *supra-anal large with two large tentacular structures on each mantle edge;* inner laminae of inner gills entirely connected; palpi rounded antero-ventrad, connected antero-dorsad two-thirds of their length; color of soft parts tanish, mantle edge antero-ventrad, reddish-brown.

REPRODUCTIVE STRUCTURES:—Marsupium occupying the greater posterior part of the outer gill, consisting of about fifty small ovisacs distended transversely when gravid, and being also distended at the distal ends the ovisacs presenting teat-like appearance; *no mantle flap antero-ventrad to branchial opening,* nor any specialization except for a thickening of the mantle edge; conglutinates not solid, white; glochidium ax-head or hatchet-shape in form, spined, rather small, 0.105 x 0.185mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell rather globose, extremely inflated; disk smooth; beaks extremely full, round, high, sculptured with single tubercles on incurved tips surrounded by fine concentric ridges looped into two or three small tubercular markings at very base of post ridge; epidermis smooth, polished, brown horn-color, sometimes with yellowish narrow bands parallel to growth lines, rayless.

INTERNAL STRUCTURES:—Cardinals double in right, slightly so in left valve and arranged parallel with laterals; interdentum short; laterals single in right, double posteriorly in left valve; beak and branchial cavities very deep and large, basin-like; nacre white with light rosy pink in branchial cavities, border light bluish.

Sex	Length		Height		Diameter	Locality
♂	10	x	82	x	65mm	(Mississippi R., Hanibal)
♀	95	x	75	x	66mm	(" " ")
♀	66	x	50	x	42mm	(" " La Grange)

MISCELLANEOUS REMARKS:—*Capax* has the most inflated shell of the *Naiades*, yet because of the fact that it is rayless and has no sex dimorphism, nor furrowed beak sculpture, nor pure white nacre of *L. ventricosa* it must be removed far from the latter although its immensely inflated shell would superficially class it near *ventricosa*. Its great inflation is not any greater, however, than that of the relative inflation of the *laevissima* shell in the last stage of its parasitic life. Most of all, anatomical material kept by the writer, shows no mantle flap (*Pl. XXVI, fig. 93 B*) as seen in *L. ventricosa*, nor as to be noted in any *Lampsilis*, and the mantle edge antero-ventrad to the branchial opening is not even as much specialized as in *laevissima*, or *alata;* hence its place perhaps should precede *laevissima*, at least, but is placed last in the grouping under this genus on account of its most peculiarly inflated shell which *may* show an advance over the other species that show the other extreme in possessing a compressed shell in their adult life. *Capax* is very rare shell for this State. It has a rather limited geographical distribution over the whole country; however, Simpson reports it as abundant locally, yet the writer's experience in collecting it for in the Mississippi is that it is rare even there and it was considered a stroke of good fortune to secure glochidially gravid material showing proptera characters.

Genus **Carunculina** Simpson.
(Type, *Unio parvus* Barnes.)

1898—*Caruncul ina* Simpson (in Baker, p. 109, as section).

1900b—*Carunculina* Simpson. Proc. U. S. Nat. Mus., XXII, p. 563. (as subgenus); 1912b, Ortmann, Car. Mus., VIII, p. 337 (as subgenus).

ANIMAL CHARACTERS:—Branchial opening small with rather large papillae; anal smooth, supra-anal large, closely connected to anal; inner laminae of inner gills free, more or less, from the visceral mass; palpi small, connected half of their length antero-dorsad; marsupia formed by a few large ovisacs occupying posterior part of outer gills, reniform; branchial edge with a papillose caruncle; conglutinates solid, white, club-shaped, glochidia medium in size, semi-elliptic.

SHELL CHARACTERS:—Shell very small, elliptic, rounded before, rather thick, disk smooth; beaks low, coarsely sculptured by regular concentric bars upcurved behind; epidermis dark cloth-like.

MISCELLANEOUS REMARKS:—This is a good genus as now considered by Dr. Ortmann who treated it at first (1912, p. 337) as a subgenus for *Eurynia*, but even then he was inclined to consider it as merely conventional whether we use it generically or subgenerically. *Carunculina* is remarkable for its smallest sized shells, for its unique beak sculpture and for its peculiarly specialized mantle edge antero-ventrad to the branchial opening. It is well represented in this State by the type, *parva*, and although the writer has not personally collected *tecxasensis* and *glans* yet these two have been reported in such manner that they can be definitely listed.

Carunculina parva (Barnes).

("Liliput Shell.")

Pl. III, Fig. 8c; Pl. XXVII, Figs. 95 A—D.

1823—*Unio parvus* Barnes, Am. Jl. Sci., VI, pl. XIII, fig. 18 (outline).
1900b—*Lampsilis parvus* Simpson, Pr. U. S. Nat. Mus., XXII, p. 564.
1912b—*Eyrynia* (*Carunculina*) *parva* Ortmann, An. Car. Mus., VIII p. 338.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial small, directed upward, with few but large papillae; anal also pointed upward, smooth, supra-anal present, closely but definitely connected by mantle edge; inner laminae of inner gills usually free from visceral mass about one-half of their length; palpi comparatively large, connected antero-dorsad about two-thirds of their length; color of soft parts tan-color except for a blackish or reddish border to mantle at branchial opening.

REPRODUCTIVE STRUCTURES:—Marsupia kidney-shaped, consisting of twenty ovisacs, well marked, occupying posterior half of outer gills, somewhat distended transversely and also at distal ends below the original line of sterile marsupium; border of mantle antero-ventrad to branchial opening greatly specialized into a double row of red papillae terminating in a knobbed caruncle, which, under (x87) lens, is cellular—each cell being hexagonal in shape; conglutinates white, discharged whole, club-shaped; *glochidia medium in size, sub-elliptical, hinge line straight, spineless, measures 0.175 x 0.100.*

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell very small, rather thick, elliptical, rounded before, disk without sculpture; beaks low with six coarse regular, parallel bars evenly curved up at foot of post-ridge region; epidermis brownish to reddish or olivaceous, cloth-like female shells broader posterior ends made by more swollen post ventral portion, males with pointed shells.

Sex	Length	Height	Diameter	Locality
*	38 x	23 x	19mm	(Lake Contrary, St. Joseph—)
♂	27 x	13 x	11mm	(Pond, Columbia)
*	25 x	13.5 x	11.5mm	(Lower L. Contrary, St. Joseph)
*	14.5 x	8.5 x	5.5mm	(Singleton Lake, Halls)
*	11.5 x	6.5 x	4.0mm	(" " ")

The writer obtained about forty juveniles, within the range of the last two measurements, in shallow clear water along the northwest shore of Singleton Lake. They were confined to a small space and were traced here and there among a maze of tiny tracks. These juvenile shells differ from the adult by a thinner shell, more pointed posteriorly, a more greenish epidermis, more compressed, and by a coarser beak sculpture which, although arranged the same in its concentric bars curved up posteriorly, yet they extend down well on the center of the disk. (*See Pl. III, fig. 8c*).

MISCELLANEOUS REMARKS:—*The writer is able to bear out the statements of Drs. Sterki and Ortmann that parva is locally hermaphroditic.* In the past three years, hundreds have been collected in nearly all the Northwest Missouri lakes and streams, but not a single one has been found without the marsupial character of gills and the sexually dimorphic female shell. However, the male and female shells appear in Central Missouri. In all specimens for this State the writer finds the supra-anal opening present. Its presence has been doubted by some other writers. This pygmied mussel has great vitality. The writer records thirty-eight heart beats per minute—among the most rapid of the *Naiades*. It is one of the most active in its locomotion. Its breeding season show it to be bradytictic. *The writer has been fortunate to secure parva's glochidium and make more of a definite study than has been recorded since Lea left his studies.* (Obs. XIII, 1874, pl. XXI, fig. 2.)

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* This symbol (*) would indicate hermaphroditism here.

Caruncülina texasensis (Lea).

("Texas Shell.")

Not figured.

1857—*Unio texasensis* Lea, Pr. Ac. Nat. Sci. Phila., p. 84; Jl. Ac. N. Sci., IV, 1860, p. 359, pl. XLI, fig. 184.

1862—*Unio bealei* Lea, Jl. Ac. N. Sci., V., p. 204, pl. XXX, fig. 273.

1912b—*Eurynia (Caruncülina) texasensis* Ortmann, An. Car. Mus., VIII, p. 339.

Animal Characters:—The writer not having seen the soft parts of this species quotes Simpson's description:—"Animal with marsupium consisting of a few large ovisacs (8 to 13); inner gills wholly, or in part, free from the abdominal sac; female often having a well developed caruncle on the mantle below the branchial opening."

SHELL CHARACTERS.

External Structures:—Shell small, rather thick, subinflated, smooth, rounded before, pointed post-dorsad; post-umbonal ridge rather prominent, especially in the female shell, which is shorter, more inflated and not so pointed posteriorly; epidermis a dark slaty color with one or two whitish rest lines; beaks low with coarse concentric bars upcurved at base of post-ridge.

Internal Structures:—Cardinals double in right, faintly so in left valve; laterals single in both; interdentum lacking; beak and branchial cavities rather shallow and irridescent posteriorly.

Sex	Length		Height		Diameter	Locality
♂	45	x	24	x	17.5,mm	(Lost Creek, Amity)
♀	37	x	20	x	12.0mm	(Lost Creek, Amity)

Miscellaneous Remarks:—Comparison to some types of *texasensis* from Wimberly Lake, Texas, assures the writer that the specimens of the above measurements are a near approach, at least, to this species. However, this species is listed for Mo. more on the strength of Mr. Simpson's report of it for Harrison County, Missouri. where the famous author of the "Synopsis of the Naiades" used to reside. He states that *texasensis* ranges north into northern Missouri, southern Illinois and Indiana. This species is a good one and should be shut out of the synonomy of *parva* especially because its posterior end of shell is never evenly rounded, nor is its epidermis as cloth-like and nacre as white as that of *parva*. The sex dimorphism, too, is different, as determined by the above description of shell.

Carunculina glans (Lea).

("Little Purple.")

(*Not figured.*)

1834—*Unio glans* Lea, Tr. Am. Phil. Soc., p. 82, Pl. VIII, fig. 12, Obs. X, 1863 p. 402.

1900b—*Lampsilis glans* Simpson, Pr. U. S. Nat. Mus. XXII, p. 565.

1912b—*Eurynia* (*Carunculina*) *glans* Ortmann, An. Car. Mus., VIII, p. 339.

ANIMAL AND SHELL CHARACTERS:—Since the writer has not secured any actual shells or soft parts for this species the descriptions of these parts do not appear here.

MISCELLANEOUS REMARKS:—The writer would also lay claim to this species for Missouri from Simpson's report of it for the White River, and also from a few scattered reports of it through some local collectors for the Elk River and other Southern Missouri streams. From Lea's description (Obs. X., 1863, pp. 402 and 405) and also from Wilson and Clark's (1912, p. 48) this species falls under this genus. From shells received by the writer in exchange it would seem to be more nearly like a young *P. purpurata*. It is distinguished from *C. parva* in being a wider, shorter, thicker, heavier and more polished shell and also in possessing a prominent post-umbonal ridge and a coppery and purple nacre.

Genus **Eurynia** Rafinesque.

(Type, *Unio recta*, Lamarck.)

18120—*Eurynia* Rafinesque Monog., Ann. Gen. Sci Phys. Brux.; 1900b, Simpson, Pr. U. S. Nat. Mus., XXII, p. 534 (as section); 1912b, Ortmann An. Car. Mus., VIII, p. 336 (as genus).

ANIMAL CHARACTERS:—Siphonal openings well formed; inner laminae of inner gills usually entirely connected to the visceral mass; in male no specialization, but in female the inner edge of mantle antero-ventrad to branchial opening always with well developed papillae, or short tentacles which often extend to the central of ventral edge; marsupium reniform, swollen, consisting of many ovisacs occupying posterior part of outer gill and ventral edges beaded in white or black pigment when gravid; conglutinates white, not very solid; glochidia large or medium in size, semi-elliptical.

MISCELLANEOUS REMARKS:—The special structures on the mantle antero-ventrad to the branchial opening would group this genus among the highest of the *Lampsilinae* from the fact that the aëration of the embryos is well secured through such specialization. Especially because of the number, form and arrangement of the papillae two sub-genera may be marked out. In the following description when the specialized mantle edge is discussed the female is considered.

Sub-genus **Micromya** Agassiz.

(Type, *Unio fabalis* Lea.)

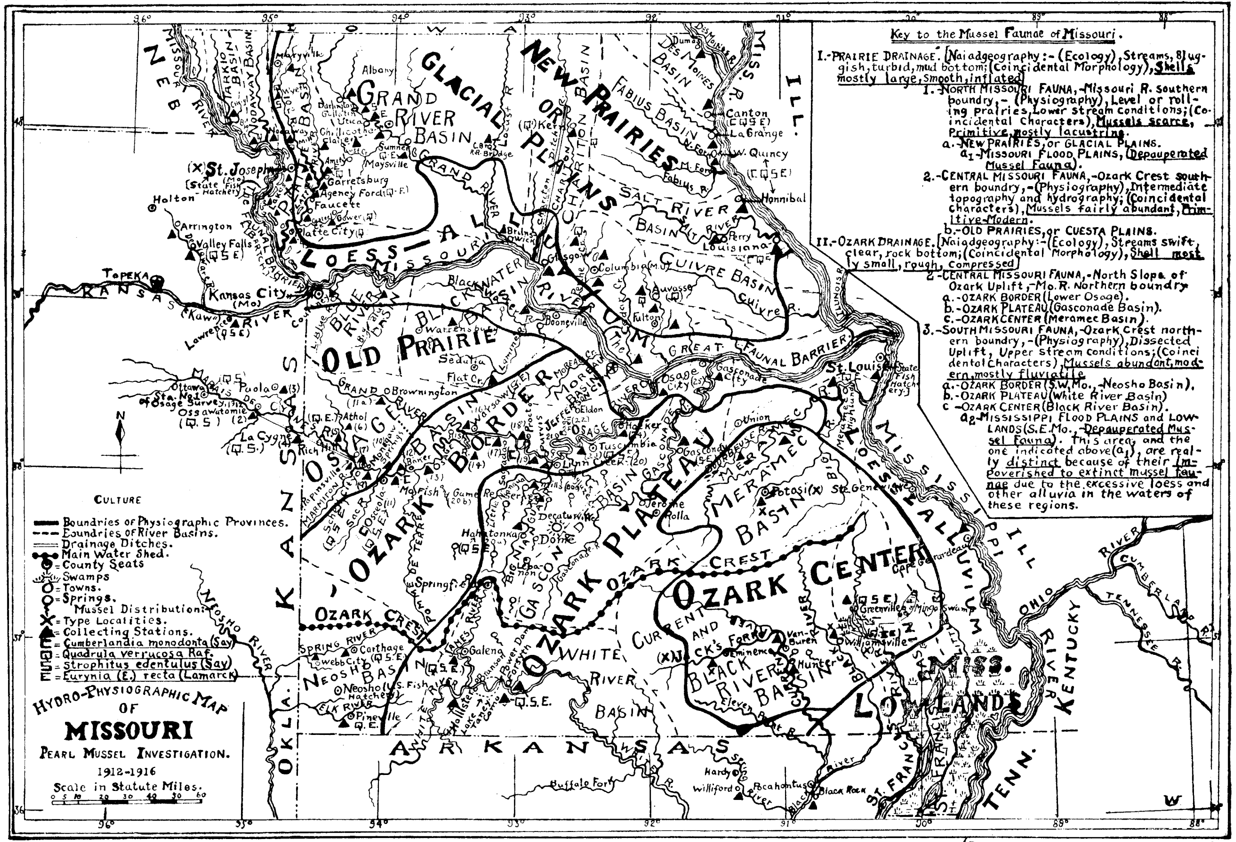
1852—*Micromya* Agassiz, Arch. für Nat., p. 57; 1912b, Ortmann, An. Car. Mus., VIII, p. 337.

ANIMAL CHARACTERS:—Mantle edge antero-ventrad to branchial opening specialized by papillae, both regular and irregular, arranged rather widely separated in a single row but never extending to the middle of the ventral margin; inner laminae of inner gills entirely connected, or more or less free.

SHELL CHARACTERS:—Shell sub-elliptical, small or medium in size; beak sculpture rather double looped-or distinctly sinuate with the posterior sinuation rather open.

MISCELLANEOUS REMARKS:—This sub-genus is represented in this state by three species—all found only in the Ozarks. The type *fabalis* of Lea of *Micromya* is not found anywhere in Missouri. The essential distinction between the two sub-genera, *Micromya* and *Eurynia* (sens. strict.) is in the less extensive and less crowded arrangement of the papillae on the inner edge of the mantle antero-ventrad to branchial opening in the former.

(To be continued.)



Key to the Mussel Faunae of Missouri.

I.-PRAIRIE DRAINAGE. [Naiadgeography:-(Ecology), Streams, sluggish, turbid, mud bottom; (Coincidental Morphology), Shells mostly large, smooth, inflated]

1.-NORTH MISSOURI FAUNA,-Missouri R. southern boundry,-(Physiography), Level or rolling prairies, Lower stream conditions; (Coincidental Characters), Mussels scarce, Primitive, mostly lacustrine.

a.-NEW PRAIRIES, or GLACIAL PLAINS.

a_1-MISSOURI FLOOD PLAINS, (Depauperated Mussel Fauna).

2.-CENTRAL MISSOURI FAUNA,-Ozark Crest southern boundry,-(Physiography), Intermediate topography and hydrography; (Coincidental characters), Mussels fairly abundant, Primitive-Modern.

b.-OLD PRAIRIES, or CUESTA PLAINS.

II.-OZARK DRAINAGE. [Naiadgeography:-(Ecology), Streams swift, clear, rock bottom; (Coincidental Morphology), Shell mostly small, rough, compressed]

2.-CENTRAL MISSOURI FAUNA,-North Slope of Ozark Uplift,-Mo. R. Northern boundry

a.-OZARK BORDER (Lower Osage).

b.-OZARK PLATEAU (Gasconade Basin).

c.-OZARK CENTER (Meramec Basin).

3.-SOUTH MISSOURI FAUNA,-Ozark Crest northern boundry,-(Physiography), Dissected Uplift, Upper stream conditions; (Coincidental Characters), Mussels abundant, modern, mostly fluviatile.

a.-OZARK BORDER (S.W. Mo.,-Neosho Basin).

b.-OZARK PLATEAU (White River Basin)

c.-OZARK CENTER (Black River Basin).

a_2-MISSISSIPPI FLOOD PLAINS and LOWLANDS (S.E. Mo.,-Depauperated Mussel Fauna). This area and the one indicated above (a_1), are really distinct because of their impoverished to extinct mussel faunae due to the excessive loess and other alluvia in the waters of these regions.

CULTURE

Boundries of Physiographic Provinces.

Boundries of River Basins.

Drainage Ditches.

Main Water Shed.

= County Seats

Swamps

= Towns.

= Springs.

Mussel Distribution:

X = Type Localities.

▲ = Collecting Stations.

C = Cumberlandia monodonta (Say)

Q = Quadrula verrucosa Raf.

S = Strophitus edentulus (Say)

E = Eurynia (E.) recta (Lamarck)

HYDRO-PHYSIOGRAPHIC MAP OF MISSOURI

PEARL MUSSEL INVESTIGATION.

1912-1916

Scale in Statute Miles.

By W. I. Utterback.

(Physiographic Features after Marbut.)